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THE NEW ENGLAND BOTANICAL CLUB

Vol. 28. January, 1926. No. 325.

NOTES ON A COLLECTION OF FRESH WATER MYXOPHYCEAE FROM AMOY, CHINA.[1]

N. L. Gardner.

During a recent visit to the Farlow Library and Herbarium, the privileges of which were extended to me for the purpose of working on a large collection of fresh water Myxophyceae collected in Porto Rico by the late Dr. Wille, I took the opportunity to examine also a small collection of fresh water forms which had been sent to the herbarium by Professor H. H. Chung, who collected them in the vicinity of Amoy, China. The material proved to be in excellent condition, having been preserved in formalin and contained a number of forms of considerable interest, some of which have not been previously described, and I am presenting herewith the results of my examination of the different species as I interpret them, with descriptions of such as are new to science.

Merismopedia glauca (Ehrb.) Naeg. A 95.

Chamaesiphon sp. A 83. Material young.

Pleurocapsa fuliginosa Hauck. A 74b. The material of this species is all in the vegetative condition. It answers to Hauck's description and figures in so far as they apply to the vegetative stage.

Spirulina major Kuetz. A 73b. Sparse.

Oscillatoria princeps Vauch. A 94.

O. chalybea (Mertens) Gom. A 73.

O. amphibia Ag. A 73a.

O. tenuis Ag. var. tergestina (Kuetz.) Rab. A 73c.

O. sancta (Kuetz.) Gom. var. caldariorum Lagerh. A 71b.

O. laete-virens (Crouan) Gom. A 107a.

O. irrigua (Kuetz.) Gom. A 67.

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[1] Contributions from the Cryptogamic Laboratories of Harvard University, xcii.

O. subtilissima Kuetz. var. litoralis (Hansg.) DeToni. A 102.

Phormidium Corium (Ag.) Gom. A 70.

P. quadripunctulata (Brühl and Biswas.) Gardner, comb. nov. *Oscillatoria quadripunctulata* Brühl and Biswas.[1] A 49, A 86a. The material of this species is attached to the gelatinous tegument of *Rivularia* (Gloeotrichia) *indica* (Schmidle) DeToni, and it has a thin, but very distinct, sheath. The trichomes correspond exactly to the description and figures of Brühl and Biswas (loc. cit.). Although I have not examined any of their material of that species it seems necessary to make the new combination.

P. cabennense Gom. A 88a.

P. orientale G. S. West, var. **breviarticulata** Gardner, var. nov. Trichomes very slightly constricted at the dissepiments; cells one-third to two-thirds as long as broad, otherwise as the species.

Growing on the bank of a ditch. Amoy Island, Fukien Province, China. *H. H. Chung*, A 74, type, in Farlow Herbarium.

P. calidum (Kunth) Gom. A 74a.

P. foveolarum (Mont.) Gom.

P. bigranulatum Gardner, sp. nov. Filaments scattered on or within the soft tegument of the host, long and relatively straight, 0.8–1.0 μ in diameter; trichome 0.7–0.9 μ in diameter, not constricted at the dissepiments, neither uncinate nor capitate; cells 9–13 μ long, cross walls inconspicuous, with two conspicuous granules at each cross wall, eruginous; sheath imperceptible except where there is a break in the trichome or occasionally at the ends of the trichome.

Growing on or within the gelatinous tegument of *Rivularia* (Gloeotrichia) *indica*, attached to submerged aquatic plants. Amoy Island, Fukien Province, China. *H. H. Chung*, A 90a, type, in Farlow Herbarium.

Phormidium bigranulatum, as diagnosed above, is related to *P. laminosum* (Ag.) Gom. and to *P. angustissimum* W. and G. S. West. It differs from the former in being smaller, in having blunt apices, and in having but two, instead of four, granules at the partitions. The latter species is smaller and has no granules.

Lyngbya epiphytica Hieron. A 71a.

Anabaena macrospora Klebh. var. **distorta** Gardner, var. nov. Filaments densely intertwined and much contorted, forming thick abundant, floating masses; cells densely and coarsely granular, the granules being irregular in form and dark colored; resting spores more or less asymmetrical, 9–10 μ in diameter, 14–15 μ long, filled with large refringent granules; heterocysts spherical, 7.0–7.4 μ in diameter.

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[1] Brühl, P. and Biswas, K. Commentationes algologicae. I. The algae of Bengal filter-beds. Jour. Dept. Sci. [Univ. Calcutta] Botany. **4:** 5. *pl. 1, fig. 6.* 1922.

Floating in great abundance along the margin of a pond. Amoy Island, Fukien Province, China. *H. H. Chung* A 93, type in Farlow Herbarium.

The variety differs from the species in having slightly smaller spores and cells, with the spores densely granular and more curved, in having slightly larger heterocysts and in having much distorted filaments.

ANABAENA sp. Sterile. A 53, A 100, A 103 and A 107.

NOSTOC sp. Sterile and young. A 89.

CYLINDROSPERMUM sp. Sterile. A 69.

CALOTHRIX PARIETINA (Naegl.) Thur. A 88.

C. linearis Gardner, sp. nov. Filaments free among other algae, 500–800 μ (occasionally up to 1500 μ) long, slightly enlarged at the base, the remainder linear, sparsely branched; branches usually single and erect, rarely geminate and scytonematoid; trichomes almost cylindrical throughout the entire length, 3–5 cells at the base slightly wider than the remaining cells, these cells later changing into resting spores, 6 μ in diameter at the base, tapering from 6.3–4.0 μ just above the base to 2.5 μ at the apex, terminating in a hair (?) bright eruginous, with relatively large granules in the cell; cells varying from one-third to two-thirds as long as the diameter below to 2.5 to 3 times as long above; heterocysts hemispherical, basal and intercalary (?); sheath thin, hyaline, homogeneous, not ocreate above.

There is no data accompanying this species but presumably it was collected in the vicinity of the University of Amoy, Fukien Province, China. *H. H. Chung,* A 54, type, in Farlow Herbarium.

This species of Calothrix may be distinguished by the relatively long filaments which taper but very slightly and extremely gradually from a short distance above the base to the apex, only a few cells above the base of the trichome being larger than the others. I was unable to find any trichomes with hairs, but since the delicate sheath extends beyond the ends of the trichomes it is presumed that the hairs have disappeared. The branching is sparse and it is not possible to state whether or not the break in the trichome and branching at the point which follows, takes place before or after a heterocyst is formed on the base of the part above. Geminate branching may take place without any heterocysts being formed. The material is apparently young and the few resting spores observed seemed not mature. These were several times longer than the diameter.

RIVULARIA (Gloeotrichia) INDICA (Schmidle) DeToni. A 86, A 90. The material of the two above numbers seems scarcely mature. The resting spores in many cases have not started to develop, but some are 70 × 12–15 μ, with hyaline walls. The spores seem to be formed by the fusion of 2–4 basal cells. The trichomes extend outward and terminate in a long hyaline hair. After the hair dies back, the outer end of the trichome is considerably larger than the middle portion, even down to near the base. The colonies seem larger than those of *R. indica* but the material is all in formalin and the teguments have swollen and fused. It may be that it will be necessary to create a new species for the material when more is known about its life history.

TOLYPOTHRIX **Chungii** Gardner, sp. nov. Filaments 20–24 μ in diameter, forming together with other filamentous algae a free floating, flocculent stratum, sparsely branched; trichomes 18–20 μ in diameter, bright eruginous, not constricted at the dissepiments; cells one-fourth to one-half as long as the diameter, more or less finely granular; heterocysts spherical or in part compressed spherical numerous, single; trichomes mostly conical at the point of attachment to the heterocysts; sheath relatively thin, homogeneous and hyaline in the juvenile state, becoming slightly honey colored or brownish at maturity.

Growing in company with other algae in a pool near the University of Amoy, Fukien Providence, China. *H. H. Chung*, A 71, type, in Farlow Herbarium.

T. tenella Gardner, sp. nov. Filaments aggregated into small tufts or fascicles, 3–4 mm. long, 12–15 μ in diameter; trichomes 10–12 μ in diameter, deeply constricted at the dissepiments; cells one-fourth to one-half as long as broad, eruginous, finely granular, cross walls very thin; heterocysts single, rarely 2–3 catenate, numerous, spherical; sheath hyaline, homogeneous, membranaceous in the juvenile stage becoming thicker and subgelatinous when older.

Growing on stones and small roots in sheltered pools of a mountain stream. Amoy Island, Fukien Province, China. *H. H. Chung*, A 75, type, in Farlow Herbarium.

Tolypothrix tenella is probably most closely related to *T. lanata* (Desv.) Wartmann, from which it differs in having shorter filaments with greater diameter, in having shorter cells which are deeply constricted at the dissepiments, and in part decidedly dolioform in the apical portion of the trichome.

UNIVERSITY OF CALIFORNIA, Berkeley, California.

CAREX LIVIDA AND C. GRAYANA.

M. L. Fernald.

One of the neatest sedges of northern bogs is the very glaucous or almost white plant known as *Carex livida* (Wahlenb.) Willd. In North America this species has its greatest development in Newfoundland and the cooler regions of Canada, and southward it is decidedly local: a single station each in marly bogs of Aroostook Co., Maine, Addison Co., Vermont and Essex Co., Massachusetts (with a tradition of a station in Berkshire Co.[1]); more extensive areas in north-central New York, the New Jersey Pine Barrens and in northern Michigan; and a local colony in Mendocino Co., California. In Eurasia it is confined to Scandinavia and Russia.

As it occurs throughout most of its range *Carex livida* has rather stiff culms up to 4.5 dm. high, with the staminate spike 1.5–2.5 cm. long and borne usually on an elongate peduncle; the 1 or 2 pistillate spikes subapproximate, the lower only very exceptionally on a capillary basal peduncle; and the thick-fusiform to rhomboid perigynia 3.2–4.6 mm. long and tapering to an acute or subacute conical tip. This is the plant most often collected and known as *C. livida* and we find it well described by such specialists on *Carex* as Kükenthal and Mackenzie, the former saying "Utriculi . . . 3½–4 mm. longi . . . in stipitem conspicuum contracti, apice integro acuti,"[2] the latter, "perigynia 3.75 mm. long . . . narrowed and pointed but not beaked at apex."[3] The plant answering these specifications is one of the dominant sedges of wet bogs and tundra of Newfoundland; but on the south side of the Straits of Belle Isle, in Newfoundland, in the region where so many relics of a more ancient flora occur, there is a little plant at once suggesting *C. livida* and occurring in similar habitats, but with low stature (down to 0.5 dm. high), the lower spikes mostly on capillary basal peduncles, the staminate spike only 0.7–1.5 cm. long and short-peduncled, and the perigynia only 2.2–3.2 mm. long and rounded at summit much as in *C. aurea.*

Search in the Gray Herbarium reveals plants with similar characters (though some of them of taller stature) only from Lapland and adjacent regions of Scandinavia and from the Canadian Rocky Mountains.

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[1] Becket acc. to Dewey, Am. Journ. Sci. x. 42 (1826) and xli. 329 (1866).

[2] Kükenthal in Engler, Pflanzenr. iv^{20}: 510 (1909).

[3] Mackenzie in Abrams, Ill. Fl. i. 322 (1923).

All the sheets seen from the latter region have the short round-topped perigynia and short staminate spike and at least one specimen on each sheet shows the long capillary basal peduncle, but some Lapland specimens, although having short perigynia and short staminate spikes show a definite transition in the form of the perigynia to that of the plant which is generally called *C. livida,* the plant which Chester Dewey in 1834 so beautifully described as *C. Grayana,* "Found in 1832 in a sphagnous swamp, near Utica, N. Y., by Dr. A. Gray, an active botanist."[1] When he published *C. Grayana* Dewey said, "It is a beautiful species, and has a remote resemblance to *C. livida,* Wahl., which grows two or three inches high in the marshes of Lapland"; but in 1835 Gray, himself, reduced *C. Grayana* outright to *C. livida,* saying: "My specimens agree in every respect with an European specimen of *C. livida* in the herbarium of the late Rev. Mr. Schweinitz; but I have never noticed the distant or subradical peduncles, as in Schkuhr's figure."[2] Dewey promptly accepted Gray's decision and in his *Index to Species* which closed his long series on *Caricography* he cited it[3] only as a synonym of *C. livida.*

In view of the discovery in northwestern Newfoundland of the little plant with short round-topped perigynia, short staminate spike and remote subradical peduncles, a plant matched in its technical points by specimens from Lapland and from the Canadian Rocky Mountains (a very characteristic and frequent range) Wahlenberg's original description of *C. limosa* δ. *C. livida* at once becomes illuminating:

"δ. *C. livida:* spicis subbreviter pedunculatis paucifloris, bracteis amplectentibus foliaceis infima remotissima . . . capsulis ovato-suboblongis triquetro-depressis obtusiusculis . . . *Hab.* in paludibus ad fontes sylvestres Lapponiae Enontekensis."[4]

Furthermore, Willdenow, who raised Wahlenberg's variety to specific rank, gave a description perfectly applicable to the little plant of northwestern Newfoundland:

"Carex *livida.*

C. spica mascula solitaria, foemineis binis subsexfloris, superiore incluse pedunculata, inferiore subradicali pedunculata, stigmatibus tribus, fructibus oblongis triquetris utrinque angustatis obtusis squamam oblongam aequantibus."[5]

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[1] Dewey, Am. Journ. Sci. xxv. 141, t. S. fig. 59 (1834).

[2] Gray, Ann. Lyc. N. Y. iii. 234 (1835).

[3] Dewey, Am. Journ. Sci. xlii. 330 (1866).

[4] Wahlenb. Vet.-Akad. Nya Handl. Stockholm, xxiv. 162 (1803).

[5] Willd. Sp. Pl. iv. 285 (1805).

Schkuhr's figure[1] of *C. livida,* although crude, shows a plant with remote subradical pistillate spikes and short staminate spikes, but the perigynia are shown as transitional in form between the most extreme plant with round-tipped perigynia and the more generally known *C. Grayana.* Kükenthal (*l. c.*), citing Schkuhr's figure, characterizes it as "mala!" As an illustration of *C. Grayana,* which Kükenthal describes as *C. livida,* it is certainly poor; as an illustration of the rarer plant, which seems to be what Wahlenberg and Willdenow first had, it is not so bad. It was drawn from very immature material with the anthers and the stigmas intact and the perigynia not yet distended. In this connection Asa Gray's comment, when reducing to *C. livida* Dewey's *C. Grayana,* is interesting: "but I have never noticed the distant or subradical peduncles, as in Schkuhr's figure." *C. Grayana* very rarely does produce remote subradical long peduncles (*C. livida,* var. *radicalis* Paine[2]) but plants with such basal peduncles are exceptional individuals and in no wise a true geographic variety. It seems, however, that *Carex Grayana* should be revived as a well defined variety of *C. livida.*

Carex livida and its extreme variation, *C. Grayana,* have the terminal spike strictly staminate or in very rare individuals with a few pistillate flowers at base. Somewhat west of the region where true *C. livida* was found in northern Newfoundland, Messrs. Long, Wiegand and I got another plant which in habit, pale foliage, short round-tipped minutely papillose perigynia and 3 stigmas is typical *C. livida,* but with the terminal spikes uniformly gynaecandrous, so that the plant strongly suggests *C. rufina* Drejer, a rare species of Scandinavia and Greenland. *C. rufina* and its close relative, *C. bicolor* All., which is frequent in northwestern Newfoundland, both have 2 instead of 3 stigmas and the strange plant of the barrens at Four-Mile Cove cannot be put with them. Differing from *C. livida* only in having the terminal spike gynaecandrous, it is probably best treated as an extreme variety of that species. The *Carices* with gynaecandrous terminal spikes are, however, generally so constant in this character that, when this plant is secured in mature condition, it may well prove to merit recognition as a species.

The variations of *Carex livida* here discussed may be summarized as follows.

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[1] Schkuhr, Riedgr. ii. 58, t. Ssss, fig. 211 (1806).

[2] Paine, 18th Ann. Rep. N. Y. State Cabinet, 159 (1865).

CAREX LIVIDA (Wahlenb.) Willd., var. **typica**. *C. limosa* δ. *C. livida* Wahlenb. Vet.-Akad. Nya. Handl. Stockholm, xxiv. 162 (1803). *C. livida* (Wahlenb.) Willd. Sp. Pl. iv. 285 (1805); Schkuhr, Riedgr. ii. 58, t. Ssss, fig. 211 (1806).—Culms 0.5–3 dm. high: lower spike often remote, subradical and on a capillary peduncle: terminal spike staminate, 0.7–1.5 cm. long: perigynia 2.2–3.2 mm. long, rounded or obtuse at summit.—Lapland and adjacent northern Scandinavia; northwestern Newfoundland; southern Alberta. The following are characteristic American specimens. NEWFOUNDLAND: turfy limestone barrens, northern half of Burnt Cape, Pistolet Bay, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss,* no. 27,672. ALBERTA: bog, Lake Louise, *Brainerd,* no. 102; Banff, *J. Macoun,* no. 7444; Laggan, *J. Macoun,* no. 64,154.

Var. **Grayana** (Dewey), n. comb. *C. Grayana* Dewey, Am. Journ. Sci. xxv. 141, t. S, fig. 59 (1834). *C. livida* of most authors.—Culms 1.5–4.5 dm. high, rarely with basal spikes: terminal spike staminate, 1.5–2.5 cm. long: perigynia 3.2–4.6 mm. long, thick-fusiform to rhomboid, tapering above to an acute or slenderly-conical summit,—Scandinavia and Russia; Straits of Belle Isle, Labrador to Alaska, s. to Newfoundland (common), the Magdalen Islands, southern Aroostook Co., Maine (Crystal), Addison Co., Vermont (Bristol), Essex Co. (Boxford) and Berkshire Co. (Becket), Massachusetts, north-central New York (Herkimer Co. to Monroe Co.), Pine Barrens of New Jersey, northern Michigan and Mendocino Co., California.

I am fully aware of *C. livida,* var. *radicalis* Paine, 18th Ann. Rep. N. Y. State Cabinet, 159 (1865), but that is only a very exceptional departure from the widespread var. *Grayana,* its own author specifically stating that "Specimens of this variety are very scarce, perhaps two or three occurring in a hundred of the regular species." To take up for *C. Grayana* the name *C. livida,* var. *radicalis* would lead only to confusion.

Var. **rufinaeformis**, n. var., var. typicam simulans; differt spica superiori gynaecandra.—NEWFOUNDLAND: wet muddy hollow in limestone gravel-barren, Four-Mile Cove, Straits of Belle Isle, July 20, 1925, *Fernald, Wiegand & Long,* no. 27,673 (TYPE in Gray Herb.).

GRAY HERBARIUM.

NOTES ON THE RANGE OF MAIANTHEMUM CANADENSE AND ITS VARIETY INTERIUS.

F. K. Butters.

In 1904, Fernald[1] described as a new variety (var. *interius*) the pubescent form of *Maianthemum canadense* which occurs in the region of the Great Lakes and westward. At that time he found that all the specimens of this species from Michigan and eastward were glabrous, while with a single exception all those from "western Ontario, Manitoba, Saskatchewan, and Alberta, southward to South Dakota, Iowa and Illinois" were pubescent. More recently pubescent specimens have been found from Oswego County, N. Y.[2] and even from Massachusetts; while my studies of the flora of Minnesota indicate that both varieties are common in that state, though with quite distinct ranges. It seems worth while, therefore, to note as definitely as possible the range of the two varieties, both in Minnesota and in the country at large.

Typical *M. canadense* (the glabrous form) is, as Fernald pointed out, northeastern, but it extends down the Alleghenies to North Carolina, and westward along the upper Great Lakes into Minnesota, being confined in that state almost entirely to the region of boreal coniferous forests. Of eighteen Minnesota specimens of this form in the herbarium of the University of Minnesota, seven are from north of Lake Superior, and all but two of the others are from the north central part of the state, reaching as far west as Lake Itasca. South of the region of general coniferous forest, it occurs very sparingly with other boreal plants in cold tamarack swamps near the eastern edge of the state as far south as St. Paul, and there is a single specimen from Lake City, Wabasha County, in the southeastern part of the state—a region where plants of relatively boreal character often occur sporadically.

Outside of Minnesota, but in the general region of the Great Lakes, there are specimens of typical *M. canadense* in the Minnesota herbarium from the following stations: Western New York: Lowman's Swamp, Chemung Co., May 30, 1884, *T. F. Lucy;* rich deciduous woods, Van Etten township, Chemung Co., June 3, 1915, *L. H.*

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[1] Fernald, M. L., *The Western Variety of Maianthemum canadense.* Rhodora xvi, 210 (1914).

[2] Fernald, M. L., and Wiegand, K. M., *Notes on some Plants of the Ontario and St. Lawrence Basins, New York.* Rhodora xxv, 219 (1923).

Mac Daniels, A. J. Eames, no. 3727; Ithaca, June 2, 1891, *Elias J. Durand* (a mixture of the two varieties). OHIO: woods, Parma. May 1, 1894, *J. R. Watson;* Berea, May, 1897, *G. B. Ashcroft,* flora of the Western Reserve. MICHIGAN: swamp, Lake Harbor, May 28, 1898, *L. M. Umbach;* moist rich soil, Grand Rapids, June 1, 1894, *Emma J. Cole* (mixed); moist woods, Hamilton, May 30, 1891, *C. L. Herron* (mixed). INDIANA: thickets, Pine, May 15, 1896, and July 9, 1897, *L. M. Umbach* (mixed). WISCONSIN: pine woods, St. Croix Falls, June 5, 1920, *F. K. Butters* (mixed). Fernald[1] also cites a specimen from Brown County, Wisconsin.

It appears, therefore, that this essentially northeastern plant extends along the whole length of the Great Lakes, that westward it becomes quite definitely a plant of the coniferous forest, and that along the southern border of its range it frequently occurs mixed with the pubescent variety.

Maianthemum canadense var. *interius* in Minnesota is distinctly a plant of the deciduous forest, and is particularly abundant in the rather acid oak woods of the east central and southeastern parts of of the state. It is less common in the heavier forests which occupy the richer calcareous soils farther west, but it occurs there, and even in some of the prairie groves in the extreme western and northwestern parts of the state. It occurs occasionally in Tamarack swamps, and in such situations may sometimes be found growing with the glabrous form. For the most part it barely encroaches on the northeastern belt of coniferous forest, and when it does enter this region it is in company with the typical trees and herbs of the deciduous woodlands. Thus the only collection from north of Lake Superior is from eastern Cook County, a few miles back from Grand Portage, where it occurs in an almost pure forest of hard maple along with a number of other plants of relatively southern distribution. In the Minnesota herbarium there are 43 Minnesota collections of this variety, 15 of typical *M. canadense,* and three mixed collections, two from the vicinity of Brainerd, and one from Lake City.

In addition to the mixed specimens cited under typical *M. canadense* and the specimens cited by Fernald in his original paper, specimens of *M. canadense* var. *interius* have been seen from the following stations outside of Minnesota: MACKENZIE: Ft. Smith, June 25, 1901, *E. A. Preble & A. E. Preble,* plants of Canada (specimen in the Na-

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[1] Loc. cit. 210.

tional Herbarium). North Dakota: rich woods, Walhalla, July 8, 1912, *H. F. Bergman.* South Dakota: Piedmont, June, 1895, *Alice D. Pratt.* Iowa: woods, Fayette, May 20, 1894, *Bruce Fink.* Wisconsin: Galesville, June 1, 1889, *Sidney C. White, Jr.* Indiana: Lake Everett, Allen Co., May 26, 1916, *Chas. C. Deam.* New York: Sandy Creek Township, Oswego Co., Aug. 25, 1922, *M. L. Fernald, K. M. Wiegand & A. J. Eames* (Herb. Gray). Massachusetts: clay soil, Chicopee, May 18, 1913, *John Murdock, Jr. & G. S. Torrey* (Herb. N. E. Bot. Club—this specimen was kindly called to my attention by Professor Fernald).

It appears, therefore, that this essentially western variety, *M. canadense* var. *interius,* occurs sparingly eastward along the south side of the Great Lakes, and even in western New England. Apparently it does not follow the typical form into the more southern part of the latter's range in the southern Alleghenies, nor does it anywhere penetrate far into the northeastern coniferous forest.

The taxonomic relations of these two varieties have proved to be very interesting, but a discussion of these relations, and also of the taxonomy of the other species and varieties of the genus *Maianthemum* is reserved for another paper which is at present in preparation.

University of Minnesota.

POLYGONUM HYDROPIPEROIDES AND P. OPELOUSANUM.

E. E. Stanford.

Polygonum hydropiperoides Michx., like many other early-described species, suffered from much early confusion in the literature. In its typical region it is an essentially well marked species, but material collected over a wide area, as represented by the collections of the Gray Herbarium, presents many puzzling variations in both habital and technical characters. Some, but by no means all, of these aberrancies have been described as varieties. The species often becomes semi-aquatic, but the characteristic ecological forms which mark *P. natans* and *P. coccineum* are absent. Many of the variations observed in the course of this study occur apparently as isolated examples in scattered areas; they are often characterized by a larger proportion of defective pollen than is usually found in more typical specimens, but, unlike the amphibious species, they are usually productive of apparently normal achenes. Occasionally the characters suggest blending with other species. It has been conjectured in an earlier paper that many observable variations may be due in part at least to hybrid origins. It is not proposed, however, to publish the material which gives rise to such suspicion as hybrid; the evidence and conjecture are offered mainly to call the attention of students of variation to the phenomena, in order that further studies, particularly in the field, may more fully elucidate the matter. There remain, beside what is considered the type, several definite variations referable to *P. hydropiperoides*, and some account of the literature is in order to indicate something of their history and affinities.

Walter published *Polygonum barbatum* "stipulis truncatis setaceo-ciliatis *dorso pilosis;* spica virgata, *basi scabra.*"[1] The brief description is applicable as far as it goes; it was published, however, under the general heading: "Persicariae pistillo bifido aut staminibus minus 8."

Except in *P. persicarioides* HBK. (which, as later stated, it is proposed to reduce to a variety of *P. hydropiperoides*), which is not reported in Walter's area, and a Californian variety herein described as new, *P. hydropiperoides* is characteristically trigynous, though the stamens are characteristically eight, but sometimes reduced in number. It may be pointed out, furthermore, that Walter, under the same heading, described *P. hirsutum*, in which the same conditions obtain. The name *P. barbatum* had been used for a Chinese plant described by Linnaeus, with which Walter doubtless confused his plant (Walter's work gives no citations). The name *P. barbatum* occurs in some later American works; *e. g.* Barton (1818) where from the description its applicability to *P. hydropiperoides* is more clear.

Polygonum hydropiperoides was published by Michaux.

"P. stipulis undique hirsutis, promisse ciliatis: foliis angusto-lanceolatis, sessilibus, minutim asperiusculeque hirsutulis: spicis linearibus, debilibus; bracteis subimbricatis, ciliatis; floribus octandris, semitrigynis. *Obs.* Habitus *Hydropiperis:* non acre; folia angustiora: flores purpurascentes, raro 7-andri. *Hab.* in Pennsylvania, Virginia, Carolina."[2]

The name was used by Pursh (1814) for the still more *Hydropiper* like plant later to be described by Elliott as *P. punctatum.* Bigelow used it for a "*Hairy Polygonum.*"

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[1] Walt. Fl. Car. 131 (1788).

[2] Michx. Fl. Bor.-Am. i. 239 (1803).

"Stamens eight, styles three, half-united; stipules hairy and ciliate; leaves lanceolate, sessile, somewhat hairy; spikes linear, weak; bractes subimbricate, ciliate.

This plant, which is occasionally found about Boston in low grounds, is not the *P. hydropiperoides* of Pursh, nor *P. mite* of Elliott. The whole stem is hairy and branched, and the spikes numerous. The rest agrees exactly with Michaux's description, except that the flowers, as far as I have observed, have fewer stamens."[1]

Bigelow's description is cited without question under *P. hydropiperoides* in the bibliographies of both Meisner and Small; but, except for the three-cleft style, the description suggests nothing but *P. Careyi* Olney, a characteristic species of eastern Massachusetts, of which Bigelow's description is probably the first published notice, the "fewer stamens" of Bigelow agreeing with the five to eight stamens found in *P. Careyi.*

The name of Michaux was correctly used by Gray in the first edition of the Manual (1848) and it has been generally interpreted correctly in subsequent treatments of the group.

A name frequently used in the older works is *P. mite* Pers.[2] not Schrank. *P. hydropiperoides* Michx. was cited by Persoon as a synonym, and the description is applicable except for " fol. anguste lanceolatis hirsutis" which, in point of hairiness, seems a little excessive. No type locality is given except "Amer. boreali." Elliott, under *P. mite* Pers., stresses the same character: "leaves lanceolate, acuminate, entire, hairy . . . .

"Stipules about an inch long, very hairy, and terminated by a long fringe . . . *Corolla* white . . ."[3]

Elliott's characterization, with what can be inferred of the size of the plant from the rather large stipules, seems to run close to *P. setaceum* Baldwin, a considerably larger, more robust, and scabrous plant evidently closely related to *P. hydropiperoides.* But *P. setaceum* was first published by Elliott for Baldwin on the preceding page. Material of *P. hydropiperoides* from Elliott's section of the country is not particularly well represented in the specimens at hand, but one gets the impression from examination of southern types of both species that *P. hydropiperoides* and *P. setaceum* sometimes approach each other more closely than the extreme type of either would suggest. The quoted portions of Elliott's description would seem to apply to a median form rather than the usually purplish-flowered and barely strigose *P. hydropiperoides.* This leaf-hairiness seems to be associated with the early descriptions of *P. mite* Pers. which otherwise correspond closely to Michaux's plant.

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[1] Bigel. Fl. Bost. ed. 2: 156 (1824).

[2] Pers. Syn. i. 440 (1805).

[3] Ell. Sk. i. 456 (1817).

Polygonum hydropiperoides, or material referable to it, has also been reported from outside the United States and Canada. *P. persicarioides* HBK. was described in 1818 from "*aquis stagnantibus Regni Mexicani prope Queretaro.*" The description[1] is on the whole more suggestive of *P. hydropiperoides* than of the *P. Persicaria* which the plant suggested to Kunth. Points of difference from the more Northern plant (which may not have been seen by Kunth) are: "Calyx quadripartitus, glaber, albidus. Stamina sex teste Bonplandio. Stylus bifidus . . . Akenium lenticulare, umbonatum." Chamisso and Schlechtendal reported[2] from Chile a plant which they referred with some doubt to *P. persicarioides.* Meisner, confirming the identification and extending the range to include Colombia, Guiana, Peru, and Brazil, included in the description of the South American material of *P. persicarioides* these variations: "staminibus 7–8 styloque semi-2–3-fido subinclusis; nucula parvula biconvexo-lenticulari v. trigona . . . Spicae . . . densi-florae. Calyx 5-partitus (ex Kunth. l. c. 4-partitus, qualem nunquam inveni)."[3] In the same publication Meisner also described *P. hydropiperoides* from Brazil. Describing *P. persicarioides* again he stated it to be "Proximum P. Ludoviciano et nodoso, ab illo praecipue pedunculis glabris, ab hoc bracteis truncatis ciliolatis etc. dignoscendum."[4]

The chief demonstrable difference in the material at hand may be summed up as a somewhat more dense type of inflorescence in *P. persicarioides* (a character in which *P. hydropiperoides* varies considerably), the presence of lenticular as well as trigonous achenes, and a tendency of the latter (not always evident) to somewhat greater proportionate elongation. There is also a tendency toward a greater strigosity. The South American material in the Gray Herbarium (with the exception of certain Chilean specimens) belongs here rather than with *P. hydropiperoides* proper. In view of the generally narrow range of difference and the tendency of the types to intergrade at the southern limit of typical *P. hydropiperoides* in the south and southwest, it seems appropriate to reduce *P. persicarioides* to a variety of *P. hydropiperoides*.

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[1] HBK. Nov. Gen. et Sp. ii. 179 (1818).

[2] C. & S. Linnaea, iii. 44 (1828).

[3] Meisn., in Mart. Fl. Bras. v. pt. 1: 16, 17 (1855).

[4] Meisn. in DC. Prodr. xiv, 117 (1856).

Chamisso & Schlechtendal published a detailed description of *Polygonum virgatum*[1] from Chile and Brazil; but Meisner in 1855,[2] citing the original material, reduced the species to varietal rank under *P. hydropiperoides* and he later summed up the differences; as to the var. *virgatum:*

> "ochrearum bractearumque ciliis longioribus (illis 3–4 lin., his 1–2 lin. longis), foliis utrinque diutius pubescentibus . . . Forma P. persicarioide et setaceo valde similis, sed ab illo discrepans ciliis longioribus, spicis tenuioribus et achaenio, etc.; ab hoc spicis tenuioribus, ochrearum setis brevioribus, foliorum pilis tenerioribus nec setiformibus."[3]

This is certainly suggestive of Elliott's somewhat hairy *P. mite*. Meisner, furthermore, cited material from Louisiana, Florida, and Mexico. *P. virgatum* was reduced by Small to synonymy with *P. hydropiperoides*, and the material at hand does not justify other disposition of it, though search for a form intermediate between *P. hydropiperoides* and *P. setaceum* might re-establish *P. hydropiperoides* var. *virgatum* (C. & S.) Meisner.

In 1892, Small described *P. hydropiperoides* var. *strigosum:*

> "One and a half to two feet tall. Stem clothed with stout, appressed hairs; leaves lanceolate to linear-lanceolate, obtuse, strigillose; sheaths averaging half an inch long, densely strigose and long-ciliate; bracts strigillose and ciliate; flowers whitish.
>
> Indiana: Indianapolis, along the White River (Britton); West Virginia: Preston Co., along the Cheat River (J. D. Smith); Canada: Gatineau River (Macoun) . . . .
>
> Its almost white flowers, dense strigoseness and heavier habit separate it very clearly from the typical form."[4]

In 1895, however, Small changed the name to *P. hydropiperoides Macouni*, and gave the range as "Ontario, West Virginia, Indiana and California."[5] This is again suggestive of Elliott's hairy *P. mite* and of the *P. virgatum* of Chamisso & Schlechtendal, though from quite a different range. Material, including a specimen of Macoun's from Gatineau River, Quebec, shows fine strigosity of the stem, barely visible without a hand-lens, but scarcely "stout appressed hairs." Strigose material from California appears, on account of the tendency to production of lenticular achenes, referable to a new variety to be described in this paper. Small's variety is recognized in the 7th edition of Gray's Manual and in the first edition of Britton & Brown, but reduced (under the genus *Persicaria*) to synonymy in the second edition. It is not recognized in Small's Flora of the Southeastern United States; the description of *Persicaria hydropiperoides* as "sometimes slightly strigillose" would seem to include the plant. If the variety is to be recognized to include all strigillose material, the description should be emended to include flowers of the typical color. The varietal name *strigosum* has priority over the later chosen var. *Macouni.* To the present writer the plant appears of formal rather than varietal rank.

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[1] C. & S. l. c. 45 (1828).

[2] Meisn. in Mart. Fl. Bras. v. pt. 1: 18 (1855).

[3] Meisn. in DC. Prodr. xiv. 103 (1856).

[4] Small, Bull. Torr. Bot. Cl. xix. 355 (1892).

[5] Small, Mem. Dept. Bot. Columb. Col. i. 81 (1895).

St. John, in 1921, described *Polygonum hydropiperoides* var. *psilostachyum* from Sable Island and the state of Washington:

> "Differing . . . in having glabrous eciliolate ocreolae which have scarious transparent margins, and in the glabrous or glabrate comparatively short leaves, 4–8 cm. long, 0.8–2.4 cm. wide."[1]

The Sable Island type material is well marked; in habit it resembles a reduced specimen of the hybrid *P. hydropiperoides* × *robustius* rather more closely than typical *P. hydropiperoides.* It also possesses a larger proportion of defective pollen than the latter usually exhibits. Fruit production appears normal. St. John's publication cites *P. lapathifolium* L., and its var. *prostratum* Wimmer, *P. scabrum* Moench, *P. Hydropiper* L. and *P. Persicaria* on the island. The appearance of *P. hydropiperoides* var. *psilostachyum* does not particularly suggest admixture from any of these stocks. The Washington specimens cited by St. John are slightly less marked in the technical characters given. Other material from the Pacific Northwest in the Gray Herbarium represents a median form in possessing the ciliation and puberulent tendency of the typical species with the habital aspect of the variety *psilostachyum.*

The panicle of *P. hydropiperoides* is usually slender and simple. In some localities, particularly in Nova Scotia and California, the peduncle shows a tendency to branch in a digitate manner. Fernald in 1922, described from Nova Scotia a particularly vigorous and long-leaved plant as *P. hydropiperoides,* var. *digitatum:*

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[1] St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 71 (1921).

"Plant 1–1.5 m. high; leaves linear-lanceolate, attenuate, mostly 1.3–2 dm. long: spikes densely flowered, 0.5–1 cm. thick, mostly crowded at the tips of the branches . . . .Differing . . . in its great height, very elongate leaves, thick crowded spikes and very late flowering."[1]

This latter character was again emphasized by the same author in a later publication.[2] Typical *P. hydropiperoides* in the same region was in maturity from mid-July through August, while the variety *digitatum* barely showed color in the inflorescences on August 23, and was in anthesis in October.

Moore, in 1914, published a white-flowered plant as *P. hydropiperoides,* forma *leucochranthum.*[3]

(*To be continued.*)

A FURTHER NOTE ON CIMICIFUGA RACEMOSA IN MASSACHUSETTS.—In 1920, I found *Cimicifuga racemosa* growing naturally and abundantly in Sheffield, in the southwest corner of Massachusetts.

Believing after some research that the plant had "rarely, if ever, been found in New England north of Connecticut except in cultivation or as a garden escape," I made a record of my discovery and some observations concerning this interesting plant and its occurrence in Massachusetts. (See RHODORA, xxiii. 202, Sept. 1921.)

Its range had been given in the Gray Manual (1908) as "s. N. E. to Wisc., and southw.; cultivated and escaped eastw." I therefore cited two collections in the herbarium of the New England Botanical Club as probably such escapes, viz. one by Parlin in 1899 from "North Berwick, Maine, growing in an orchard from planted roots"; the other by John Murdoch, Jr., July 22, 1913 from "Bernardston, Mass., woods in east part of town."

Mr. Murdoch died in 1915 and I could only express the hope that my note might be productive of information which would verify not only the occurrence of the plant here, but determine its status as indigenous, or as "cultivated and escaped eastward." My wish was soon gratified and I received reliable information from two persons living in Greenfield who knew the plant well, and to whose gardens plants had long ago been transplanted from this station in the adjoining town of Bernardston.

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[1] Fernald, RHODORA, xxiii. 260 (1922).

[2] Fernald, RHODORA, xxiv. 173 (1922).

[3] A. H. Moore, RHODORA, xvi. 129 (1914).

Finally, after many invitations, the opportunity came for a personal examination of the station and on June 23, 1925, with Miss Bertha E. Christiansen, I visited the low open wild woods in the east part of the town where, remote from habitation, still grew the small native colony of Black Snakeroot, from which came Murdoch's specimens in 1913.

It is pleasant now to add this note to what I wrote in RHODORA in 1921, as it brings this attractive plant sixty miles further as a native into Massachusetts, and nearly to the Connecticut River and to the Vermont line.—J. R. CHURCHILL, Dorchester, Massachusetts.

VICTORIN'S TREATMENT OF THE LYCOPODIALES OF QUEBEC.

CLARENCE H. KNOWLTON.

IN his significant monograph of the club mosses[1] of Quebec Brother Victorin has added a companion volume to his fascinating work on the ferns[2] of the same region. Like that it falls into two parts, discussion and systematic treatment. The present volume treats very fully four species of Isoëtes, three of Selaginella, and no less than eleven of Lycopodium, together with many varieties and forms, of which several are new to science.

The author shows himself thoroughly familiar with the geological history of eastern North America and its relation to the flora. He has carefully studied the literature of the group, with special attention to the work of Lloyd and Underwood. The result is a scholarly and interesting treatise showing good and critical judgment, the result of twenty years of close observation in the field.

The ranges of the species are very carefully worked out. Especially unique is that of *Lycopodium tristachyum*, found only in eastern temperate North America, in south-central Europe and Asia Minor. "What we know personally of its occurrence here, combined with what we read of its occurrence in Europe, makes us suspect that this may be a case of a former riparian species, bordering the warmer seas, such as the sea of the Champlain period, and which might continue to live on the sands after the disappearance of the lakes and seas and the change of the dune or of the beach into heath, savanna or open pine wood. . . . The localities known in Quebec are usually situated on old shore lines of the Champlain sea."

[1] Les Lycopodinées du Québec et leurs formes mineurs, par Frère Marie-Victorin. Contributions du Laboratoire de Botanique de l'Université de Montréal. 8vo. 121 pp. $1.00.

[2] Les Filicinées du Québec, par Frère Marie-Victorin. Contributions du Laboratoire de Botanique de l'Université de Montréal. 8vo. 98pp. $1.00.

Much more is known of the group *Complanata* in North America than twenty-five years ago, which has enabled Brother Victorin to analyze the group more carefully than has been possible before. Especially clear is his description of *L. flabelliforme* as an Appalachian species distinct from, but overlapping a little in its range the more widely-distributed *L. complanatum*. "The latter is circumboreal, but not strictly circumpolar, as it is lacking in Arctic America, but it extends under one form or another into northern and central Europe, and into Asia as far as India and eastern Siberia. Besides its northern distribution in America, it occupies another definitely circumscribed area which extends along the Cordillera from southern Mexico into South America." In the group are distinguished five species, six "variations normales, géographiques, écologiques ou tératologiques," and four additional provisional varieties covering a mass of transitional material, probably of hybrid origin.

"May we not truthfully assume that this group was one of the universal elements on the floor of the great and uniform forest of Abiétinées and Cycadinées that during the Lower Cretaceous occupied North America and by the Atlantic bridge extended to the margin of the actual European continent? Later geologic history would explain well enough the actual polymorphism of the group, a polymorphism which would be due more to successive migrations and isolations than to the modifying influence of present-day conditions.

"And we should have, repeated in the limited circle of a little group of related species, the very same facts which dominate the distribution of the flora of northeastern North America."

The author, then, taking *L. sabinaefolium*, var. *sitchense* as the simplest form now known in the *Complanata*, diagrams a possible line of descent for the other forms, showing possible hybridity. This is so skilfully done that at each of the three major nodes of the diagram come forms which actually live together in the same region. There is also a similar but simpler "Phylogène hypothétique" for the *Clavata*.

As in "Les Filicinées du Québec," the systematic treatment includes very interesting notes after each species. These give all that is known of the generative cycle and the ecological relations of the species, with folklore and uses.

The characterization of species, varieties and forms is full and clear, with abundant citations, mostly of Quebec specimens. The number of minor forms described ought surely to stimulate botanists to more extensive collecting of *Lycopodium* material. There are eleven good figures and one plate in the text. There are also numerous quotations from previous students of the genus in Europe and America.

Hingham, Massachusetts.

BROMUS CILIATUS L., var. **denudatus** (Wiegand), n. comb.,—*B. ciliatus,* forma *denudatus* Wiegand, RHODORA, xxiv. 91 (1922).

When Professor Wiegand published var. *denudatus* merely as a form, he spoke of it as occurring "Throughout the range of the typical form" of the species, the plant with the median and upper sheaths villous or pilose. In my own experience, however, I have long considered the plant with glabrous upper sheaths not only as of more boreal general range but as having a strong tendency to shorter and broader leaf-blades; and a study of the collections of the Gray Herbarium and of the New England Botanical Club shows these tendencies to be even stronger than I had supposed. For instance, selecting certain northeastern areas the floras of which have been much collected, I find that these two herbaria have from the selected colder areas: 8 sheets of typical *B. ciliatus* from Newfoundland but 23 of var. *denudatus;* 0 sheets of typical *B. ciliatus* from the Gaspé Peninsula but 19 of var. *denudatus;* from the east coast of Maine 4 of typical *B. ciliatus,* 12 of var. *denudatus.* from Willoughby, Vermont 0 typical *B. ciliatus,* 7 of var. *denudatus.* For selected warmer areas the figures are: central and southern Maine, typical *B. ciliatus* 36, var. *denudatus* 11; central and southern New Hampshire, typical *B. ciliatus* 16, var. *denudatus* 0; Connecticut, typical *B. ciliatus* 10, var. *denudatus* 0. In western Newfoundland var. *denudatus* ascends to the high mountain-meadows, typical *B. ciliatus* being confined to low altitudes; on the Gaspé Peninsula, where no typical *B. ciliatus* has been found, var. *denudatus* ascends to the highest alpine meadows of the Shickshock Mts. (1000–1125 m.) and in the White Mountain region, where the plant with pilose sheaths is confined to the lower altitudes, var. *denudatus* reaches the Fan of Huntington Ravine.—M. L. FERNALD, Gray Herbarium.

The date of the December issue (unpublished as this goes to press) will be announced later.

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